A 282

THE TRUE

Nature and Cauſe

OF

The TAILS of

COMETS.

ELUCIDATED

In a rationale agreeing with their ſeveral Phanomena.

By an Enquirer.

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Prefatory Advertiſement.

THE ſubſtance of the following Eſſay was written ſoon after the Appearance of the Comet *of* 1769, *and ſhewn to a Gentleman or two of Character, as a Philoſophic Amuſement, and the Thing went no farther; but an Hypotheſis of a very different Nature having lately appeared, and ſeeming to be taking Place as a proper Solution of the Phenomena, the Author tho't himſelf intereſted to publiſh what he had ſo far expoſed, with a few Alterations to ſuit the juſt mention'd Occaſion.*

The Subject in itſelf is indeed of little importance; but right notions of the works and operations of Nature are in many Reſpects otherwiſe: Right notions of Things improve the Mind, and a juſt Manner of reaſoning a poſteriori *even in the ſmaller and leſs important Matters, capacitate it for determining, more ſafely, in Matters of greater Weight: On the contrary, an eaſy yielding to ſpecious Appearances, and reſting at the mere Semblances of Truth, corrupts and depraves it, to which we may add, that leſſer errors ever lead to greater.*

What there is of Truth in the Performance, is with all due Reſpect left to the Judgment of thoſe better verſed in the Nature of Things, by—

Their very humble Servant,

The Author.

Tails of Comets.

THE Deſign of this ſhort Eſſay, is to ſhew that the Appearances, call'd Tails of Comets, ariſe from a ſpecial Matter in their Atmoſpheres; ſomething in a State of Repulſion to theSun, and forced off by that Luminary, while theſe Bodies are in the lower part of their Orbits.

The truth of this Notion may appear by obſerving a little upon the Shapes, and the Lengths of theTails; but eſpecially by the bend in thoſe that paſs near the Sun, in their Perihelions.

The Tails have always been obſerv'd to be direct and ſtrait Bodies, excepting the bend in the fore-mention'd circumſtance; and neither one or the other of theſe have ever been obſerv'd ſwell'd on the ſides, or in the leaſt degree oval; which ſhews that their component particles have no repulſion among themſelves, and conſequently that they are not form'd of any ærial ſubſtance. It is well known that the particles of Air have a ſtrong repulſion among themſelves, by which they muſt have rendered theſe Bodies tumid; as in caſe they were only Atmoſpheres repelled, or upon being forced from their attracting center, they would always ſpread wide till they vaniſh'd and became inviſible. I imagine none will deny that the Atmoſpheres of the celeſtial Bodies are form'd of Air, that of the Sun not excepted; however I know of no Obſervation that intimates any repellency be-

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tween their Atmoſpheres; or between the Particles of Air and the Suu, by which the latter might be imagined to drive away any part of the Atmoſphere of a Comet from the head of it. There is no doubt a mutual repulſion between the fix'd Stars, thoſe other Suns, by which they are hindred from approaching one another; but it is otherwiſe between them and their Syſtems. The Planets are attracted by the Sun, and nothing appears different from this in their Atmoſpheres.

All Comets have Atmoſpheres, and yet there are ſome without apparent tails (as that of 1770,) altho' in a proper ſituation to ſhew them. Theſe are properly term'd bearded; the others not ſo, as particularly thoſe in oppoſition to the Sun, in which Point all will appear bearded. Perhaps the Nuclei of the former have little of the repulſive matter in their compoſition; or rather, they may be of too cold a temperature to volatilize and diffuſe it to the Surface of their Atmoſpheres, ſo as to render it capable of being diſengaged by the Sun's repulſion: But not to dwell on this; Were the tails really the effect of a repulſion of Atmoſpheres, there could be no Comets without Tails, ſince all have Atmoſpheres: The concluſion is unavoidable; and this alone might, well enough, be eſteem'd a ſufficient refutation of Atmoſpheric repulſion, and ſhow the impropriety of arguing for it from the mutual repulſion of electric Atmoſpheres to one another, which is plainly not applicable to ærial Atmoſpheres, they being different ſubſtances and govern'd by different Laws. And to what has been ſaid, we may add, That had the Sun ſuch power over theſe Atmoſpheres as to drive them into Tails, of ſuch lengths as we often ſee them, it would greatly leſſen them round the heads of the Comets; whereas theſe remain the ſame, if not encreaſing as they approach the Sun. But I am unawares entered on the next Article which was to be conſidered, viz.

That

That the very great lengths of these Bodies ill agree to the notion of their Atmospheres being repelled, to return again round their proper centers. The Sun's attraction is in proportion to its quantity of matter, and extremely greater than any of the Bodies in the System; and it's power of repulsion is the same; this being so, whatever substance it can drive from it's near adherence to it's attracting Body, it will of necessity drive quite away, never to return: And every repetition of distance, in the remove, must render this effect if possible more certain; perhaps more of this by and by. I shall only add here, that the appearances in the extremities of these luminous trains shew that the solar repulsion does drive them quite off, if what we can perceive may be at all depended on. We see the tails draw out to an evanescent length; or rather growing thinner and thinner till quite lost. They appear like a stream of smoke carried by the wind till it vanishes; or we may compare them to the spires of the Auora borealis which ascend and evidently vanish by avolation.

It seems to me that these Tails may be seen in the Comet's going off and coming on when at a distance, in which the Nucleus, or Head is scarce, if at all, discernable. I had an accidental sight of that of 1744-5, on the 4th or 5th of December preceeding it's full appearance. The evening remarkably clear, the Stars attracted my attention, and dwelling a little on a certain constellation, the Eye catch'd a small white streak, but as soon lost it again; thus a second and a third time, with no better success. My sight then a little fatigued, I could not recover it again; I therefore mark'd the place expecting another opportunity; but this not soon happening it was forgot. Two or three days before Christmas, being told a Comet appeared, I recurred to the place, and found it very plain to sight, and that it had mov'd two or three degrees towards the Sun. What I perceived

before,

before, was only a ſmall ſtreak like a ſhort needle ; but the head as well as the tail were now both viſible enough. I imagine at the firſt time it was not far within the orbit of Jupiter.

A young gentleman, at Haerlem, diſcover'd it in the laſt week of November, but did not, as I know of, give any account how it appeared to him, although probably aſſiſted with glaſſes, which I had not. Upon which, permit me to obſerve, that it is to be regretted that our obſervers are ſo faulty in not giving more circumſtantial accounts of what comes under their notice ; eſpecially concerning things of which, they are ſenſible, the world is greatly at a loſs: An error by which mankind, more than by any thing elſe, have been kept in ignorance of many things which might have been known ages ago.

At the diſtance this Comet was when I firſt ſaw it, it muſt have had a very conſiderable tail, otherwiſe it would have been inviſible. I ſhall make little uſe of ſo imperfect a ſight as I had of it, rather taking occaſion to mention two or three things which it ſuggeſts. One of which is, that there ſeems to be no more of Atmoſphere round the heads of Comets at greater than leſſer diſtances. Another thing is, the great repulſive force of the Sun at that diſtance, without which no tail could have appeared ; for we cannot reaſonably ſuppoſe that a meer Atmoſpheric repulſion, were it real, would reach the thouſandth part of that diſtance, any more than that Electric Atmoſpheres wou'd effect one another at any conſiderable diſtances, which they do not. So alſo, a tail at this diſtance, is a preſumption of a peculiar matter repelled to form the tail, and upon which the whole Solar Body powerfully acts.

I come now to conſider the bend, which I eſteem the ſtrongeſt evidence for the truth of my notion.

The

The Comet of 1680, had perhaps the largeſt bend of any one that has appeared in the courſe of time. It's revolution weare told is 575 years. Sir Iſaac informs, us that it paſs'd within one ſixth of the Diameter of the Sun, in it's perihelion. Imagine then what a heat it muſt ſuffer, when at more than twenty times that diſtance it will ſet any combuſtibles immediately on fire. But the things here to our purpoſe are the bend, and the motion of the tail when paſſing the Sun.

The tail was well towards 100,000,000 miles in length; and in wheeling round the Sun, muſt have ſwept a quarter part of the Heavens in one artificial day, in which the extremity of it moved at leaſt 200,000 miles in a minute of time. This velocity, it ſuddenly receiv'd upon it's appulſe, and loſt it as ſuddenly on it's receſs from the Sun. Such was the action, and ſuch the amazing changes of action, which can by no means be accounted for on the Hypotheſis of atmoſpheric repulſion. We may contrive, and talk very cleverly of the freedom for motion in a void, and the very tractible nature of ærial particles, to the leaſt imaginable impulſe; and we may be highly delighted with our concluſions from deceitful principles; but nature will not comply with our inventions; particles of air have gravity, and muſt therefore have force to ſtart them; and when put in motion in a void, foreign reſiſtance to reduce them to a ſtate of reſt again; all reaſoning is here to no purpoſe, unleſs we allow particles in a ſtate of repulſion to the Sun, and capable of a flight, in ſome degree, ſimilar to the rays of light, and exceeding what we frequently ſee in the Aurora borealis.

Mr. Dale has given us th[illegible] of ſuch a bend as we are conſidering; and if I r[illegible]ight, ſhews it to begin about, or but little below, t[illegible]ddle of the tail, according to Sir Iſaac's

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Isaac's obſervation on the forementioned Comet; and we may ſuppoſe he has given it upon good authority: But in other things, which were foreign to the deſign, the figure is fanciſull, too broad and ſharp pointed to agree with conſtant obſervation; a fault which writers and deſigners are too frequently chargeable with, and even in ſuch things as require the greateſt accuracy and preciſion. But it is time to make an end, hoping I have expreſs'd myſelf ſo as to be underſtood, and that the reader is by this time ſatisfied that in caſe of a repulſion of Atmoſpheres, the bend muſt, according to nature, begin at the head of the Comet, and that ſuch an Hypotheſis will no ways account for any of the Phenomena; while on that of particles, in a ſtate of repulſion to the Sun, and conſtantly paſſing off from the Atmoſphere of the Comet, there is no difficulty in accounting for all the appearances; particularly that on this principle the bend ſhould naturally, be at a greater or leſs degree of diſtance from the head of the Comet, according to the time the Nucleus takes in paſſing round the Sun, and the velocity of the avolating particles. But ſince a ſhort ſpace of time may change the direction of the tail, and different degrees of velocity will determine the place of the beginning bend, let it be ſuppoſed that theſe particles are 4, 7, or 10 minutes in reaching a given diſtance; the place of the bend will then be, ceteris manentibus, as the times inverſly.

THE END.

P. S. The writer did [illegible] neceſſary to uſe any accurate calculations [illegible] deſign being only to give a ſhort, and general idea [illegible] agreeable to the laws of nature, which we are [illegible]nd, wh[illegible]